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CERTIFICATE OF VERIFICATION

I, Huy Sun YUE of 648-23 Yeoksam-dong, Kangnam-gu, Seoul, Korea state that the attached documents are true and complete translation to the best of my knowledge of the Korean-English language and that the writings contained in the following pages are correct English translation of the specifications and claims of the Korean Patent Application No.P2000-71327.

Dated this 13th day of October, 2003

Signature of translator: Huy Sun Yue

Huy Sun YUE

KOREAN INTELLECTUAL PROPERTY OFFICE

This is to certify that the following application annexed hereto is a true copy from the records of the Korean Intellectual Property Office.

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Applicant(s): LG Electronics Inc.

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COMMISIONER

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【Title of Invention】 SHADOW MASK IN ORGANIC ELECTROLUMINESCENCE

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【Request for Examination】 Yes

【Purport】 We are hereby filing this application pursuant to Article 42 of Korean Patent Law and requesting for a substantive examination for this application pursuant to Article 60 of Korean Patent Law.

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【Official fees】

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【Attached Document(s)】

1. Abstract, Specification(including drawings) 1 copy

[ABSTRACT OF THE DISCLOSURE]

[ABSTRACT]

Disclosed is a large sized shadow mask for preventing a sagging and shadowing effect to thereby increasing the advantages in producing an organic EL display panel, and more particularly, a shadow mask for fabricating an organic EL display panel having a luminescent area disposed on the position where a first electrode stripe and a second electrode stripe are crossing over in a perpendicular direction, the shadow mask including a plurality of sub-masks formed with at least one shadow mask for unit device, a main frame, as a mask holder, forming a plurality of holes for mounting the sub-masks thereon.

[TYPICAL DRAWING]

FIG. 7

[INDEX WORDS]

Organic electroluminescence, shadow mask, full-color flat display

[SPECIFICATION]

[TITLE OF THE INVENTION]

Shadow mask in organic electroluminescence

[BRIEF DESCRIPTION OF THE DRAWINGS]

FIGS. 1a to 1e illustrate full colors in fabricating a typical organic electroluminescent display panel;

FIGS. 2a to 2d illustrate steps for fabricating a typical organic electroluminescent display panel;

FIGS. 3a to 3b illustrate show masks for use in a strip type and a delta type;

FIG. 4 illustrates a large sized substrate for in use of producing typical unit devices;

FIG. 5 illustrates a large sized shadow mask for use with the large sized substrate illustrated in FIG.4;

FIG. 6 illustrates a sub-mask in accordance with a preferred embodiment of the present invention;

FIG. 7 illustrates a mask frame on which the sub-mask is mounted thereon to form a shadow mask; and

FIG. 8 illustrates a large sized shadow mask in accordance with the preferred embodiment of the present invention.

Description of reference numerals for main parts in the drawings

1: substrate 2: a first electrode(anode) 3: a second electrode(cathode)

4: organic luminescence layer 4-1: red luminescent material

4-2: green luminescent material 4-3: blue luminescent material

5: large sized shadow mask 5-1: shadow mask for unit device

5-2: sub-mask 6: electrical insulation stripe 7: large sized susbtrate

7-1: large sized device 8: shadow mask frame

8-1: sub shadow mask frame 9: partition

[DETAILED DESCRIPTION OF THE INVENTION]

[OBJECT OF THE INVENTION]

[FIELD OF THE INVENTION AND DISCUSSION OF THE RELATED ART]

The present invention relates to a display panel, and more particularly, to a shadow mask for in use of fabricating a full-color organic EL display panel.

Recently, as the size of the display apparatus is becoming larger, the request of a display panel, which could be installed in a small area, is being increased, and accordingly an organic EL display panel is being noted as one of them.

The organic EL display panel has several advantages such as its thin formation enables to be addressed in Matrix and it could be even operated at the voltage lower than 15V.

FIGS. 1a to 1e illustrate the methods for embodying the above organic EL display panel in full-color, which are also described in the following 5 items.

1. A method for patterning discrete R, G, B pixels side-by-side as illustrated in FIG. 1a.
2. A method for filtering a white light-emitting OLED by color passband filters as illustrated in FIG. 1b.
3. A method for down-conversing blue light to generate green and red light as illustrated in FIG. 1c.
4. A method for filtering broad-band OLED by micro cavity-based filters as illustrated in FIG. 1d.
5. A method of three color-tunable pixel as illustrated in FIG. 1e.

Among above, the method for depositing luminescence substances of discrete R, G, B, as shown in FIG. 1a, is widely used for it generating a high luminescence efficiency.

Here, to pattern the R, G, B pixels, a shadow mask is necessarily requested. And there are two types in the shadow mask for use, which are strip type and delta type.

FIGS. 2a to 2d illustrate a method of fabricating the organic EL display panel using the shadow mask, which includes the steps of: forming a first electrode stripe in a transparent condition on a transparent substrate and thereafter establishing a partition wall thereon to subsequently form a second electrode stripe; forming a red emitting material by using the shadow mask; forming blue and green emitting materials by using other shadow mask while moving in side direction; and depositing a second electrode material so as to form the second electrode stripe in the emitting area.

At this time, however, there shall be matters to be cared which are the accuracy of

pattern and the coupling condition with a mask holder.

In other words, in using the shadow mask, the strip type shadow mask as FIG. 3a and the delta type shadow mask as FIG. 3b are sagged down due to the patterns formed on the mask.

Specifically, the strip type shadow mask in which rectangular elongated patterns are formed has greater sag than the delta-type shadow mask.

To solve the above problem, a method of forming a substrate in a large size for disposing a plurality of unit devices thereon at once so as to enhance the production efficiency, as illustrated in FIG. 4. At this time, however, the shadow mask is required to be large same as the substrate, as illustrated in FIG. 5, which increases the sagging of the shadow mask even greater.

Accordingly, to cope with above problems, a tension is applied to the shadow mask, which however causes deformation of the mask patterns, i.e., distortion or elongation, which may subsequently causes a deterioration of the accuracy of the deposition process, and a limitation of a size of the mask, i.e., lower than the maximum size of 300*300.

Moreover, even if a shadow mask with no sagging is used, metal stripes on the mask are susceptible to vibration even by a weak impact, to give damage to the barriers of the panel.

That is, since a gap between the shadow mask and the panel is very small, the vibration to the mask gives damage to the barriers at the highest positions among the barriers formed on the panel, which may cause shorts between pixels in fabrication of second electrodes.

However, one attempt to provide a larger gap between the shadow mask and the panel for preventing the damage to the barrier results in deposition of the RGB materials at inaccurate positions due to a shadow effect that causes another problem of deteriorating the quality of color.

[TECHNICAL TASKS TO BE ACHIEVED BY THE INVENTION]

Accordingly, the present invention is directed to a mask for fabricating a display panel that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

An object of the present invention is to provide a mask for fabricating a display panel,

which has no sagging, or shadowing.

Another object of the present invention is to provide a mask for fabricating a display panel, which is suitable for fabrication of a large sized, or mass production of organic EL display panel.

[PREFERRED EMBODIMENTS OF THE INVENTION]

The present invention relates to a shadow mask for in use of an organic EL having luminescent areas on the position where first electrode stripes and a second electrode stripes are crossed from each other, respectively, the mask including: a plurality of sub-masks on the shadow mask formed at least one for use in unit device; a main frame having a plurality of holes serving as a mask holder, and fitting sub-masks in the holes respectively; and a sub-frame fixed around the sub-masks for mounting the sub-masks on the main frame in such a manner that the sub-mask can be moved on sides direction without being shaken.

Furthermore, the size of the main frame is generally the same or even larger than a large sized substrate on which the plurality of unit devices are formed.

Also, according to the present invention, a shadow mask for unit device is installed at least more than once for providing a mask suitable for any sizes of the substrate as well as preventing neither sagging nor shadowing.

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

FIG. 6 illustrates a sub shadow mask in accordance with the present invention, and FIG. 7 illustrates a main frame on which is mounted a sub shadow mask to be unified as a new one shadow mask.

Referring to FIGS. 2a to 2d, a shadow mask according to the present invention includes the first electrode stripes configured of a transparent material, a first electrode pad and a second electrode pad on a transparent substrate.

As to the delta type mask, the luminescent area of the first electrode is formed in a polygonal shape which has at least 3 angles, while the non-luminescent area is formed a line shape of which the width is more narrow than that of the luminescent area for connecting the first electrodes in polygonal shapes.

Also, the first electrode formed in the luminescent area should be configured in a delta

or a triangular shape, i.e., the first and third electrode stripes should be positioned on the same line, and the second electrode deviated in a predetermined range so as to form the delta or the triangular shape.

And in case of the strip type of shadow mask as illustrated in FIG. 3, the electrode should be shaped in a stripe form.

Subsequently, a partition wall is established in the perpendicular direction of the first electrode between the luminescent areas, which then an electrical insulation strip is installed thereon between the second electrode(cathode strip). Also, a buffer layer is additionally disposed in case of need.

Referring to FIG. 6, the shadow mask according to the present invention disposes a plurality of sub-masks thereon with which are installed on the main frame for configuring the shadow mask.

Here, the sub-masks in plural, respectively, are mounted on the sub-frame in a way of moving on both sides but not shaken, the sub-frame being formed around the shadow mask.

And the sub-frames are capable of moving in the axes of x, y, z within the main frame of large sized shadow mask to be accurately conform to the position of the unit device formed on the large sized substrate.

The large sized shadow mask fabricated according to the above procedure is illustrated in FIG. 8.

The above shadow mask can be controlled of its numbers being mounted according to the numbers of the unit device formed on the shadow mask frame.

And accordingly, the large sized shadow mask can be used in various sizes corresponding to the size of the panel varied by the numbers of the unit devices, by using one frame for shadow mask and the plurality of sub-masks.

Then, the large sized shadow mask is moved to side or another shadow mask is used to deposit a red luminescent layer, green luminescent layer and blue luminescent layer at once.

At this time, substances among the organic luminescent materials which expresses red, green and blue light but do not concern with determining the colors, for example, EIL, HTL and HIL, can be deposited at once by using blank mask, while substances which determine the colors red, green and blue, such like ETL, EML are deposited on the whole luminescent

are by using large sized shadow masks.

Also, the luminescent layer showing red, green and blue colors are in a triangular shape when another repeated luminescent layer showing red, green and blue colors is in an equilateral triangular shape.

The second electrode material composed of at least one of Mg-Ag compound metal, Al or other electric material is deposited on the organic EL layer colored in red, green and blue in an area wider than the whole luminescent areas and to overlapped with the second electrode pad so as to form the second electrode stripe between the electric insulation wall.

Finally, a protection film is formed on the second electrode, encapsulation is conducted, to complete fabrication of the organic EL display panel.

[EFFECTS OF THE INVENTION]

Thus, because the mask for fabricating a display panel of the present invention is not involved in sagging, or shadowing, the mask of the present invention can improve a fabrication accuracy, and reliability, and is suitable for fabrication of large sized panel, or mass production, thereby dropping a fabrication cost. Moreover, the possibility of mounting/dismounting of mask makes maintenance of the mask easy.

It will be apparent to those skilled in the art that various modifications and variations can be made in the mask for fabricating a display panel of the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is Claimed is:

1. A shadow mask for in use of fabricating an organic EL display panel, in which a luminescent area is disposed on the position where a first electrode stripe and a second electrode stripe are crossing over in a perpendicular direction, the shadow mask comprising:

a plurality of sub-masks formed with at least one shadow mask for unit device; and,

a main frame, as a mask holder, forming a plurality of holes for mounting the sub-masks thereon.

2. The mask as claimed in claim 1, further comprising a sub-frame formed on the outer side of the main frame for mounting sub-mask to be movable in both sides in a predetermined range without being shaken.

3. The mask as claimed in claim 1, wherein the main frame is the same or even larger than a size of a large sized substrate for forming a plurality of unit devices thereon.

4. The mask as claimed in claim 1, wherein the main frame controls the numbers of sub-masks according to the numbers of the unit devices formed on the main frame.